

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC HEALTH

WALTER M. DICKIE, M. D., DIRECTOR

Weekly



Bulletin

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EDITOR

ERADICATION OF GROUND SQUIRRELS

Plague is primarily a disease of rodents, and secondarily and accidentally a disease of man. Man's safety from the disease lies in the exclusion of the rodent and his parasites. This is the basis of all preventive and eradication work. If man can live in rodent-free surroundings he need have no fear of plague, because if there be no rodents there can be no rodent parasites, and for all practical purposes the flea may be considered as the common vector of the disease from rodent to rodent and from rodent to man. The eradication of bubonic plague therefore means the eradication of rodents.

In America we have two rodents which are comprehended in this problem, the rat and the ground squirrel, and apparently each plays a very distinct role in the propagation and perpetuation of the disease. The rat (*Mus norvegicus*, *M. rattus*, *M. alexandrinus*, and *M. musculus*) is distinctly domestic in its habits, and therefore comes in more or less intimate contact with man. It is also a frequenter of the great highways of the world, traveling long distances in ships and to a limited extent on trains. It is the producer of acute outbreaks, the conduit for the carriage of the virus from its perpetuating reservoir to the body of man. The ground squirrel (*Citellus*

beechyi), on the contrary, is not a dweller in human habitations, does not travel except by short migrations, and is an almost negligible factor in the direct transfer of the disease to man. Its great function in the plague scheme is that of a rural reservoir from which from time to time the disease flows over to the suburban rat, thence to his city cousin and thence to man. This condition is not peculiar to America alone, since in China and Thibet the marmota (*Arctomys bobac*) and allied species perform a similar function.

Ground Squirrel Eradication.

The ground squirrel may be said in truth to overrun the entire Pacific coast. It is found in Alaska, and from there south along the coast into Mexico, and east, beyond the Rocky Mountains. When we include its near relatives, the prairie dog of the western plains and the ground hog of the east, representatives of the family may be said to exist over the entire United States. But the pest we know here—the ground squirrel—causes trouble enough, and no time need be wasted looking up the family history. What we are particularly interested in is the economical destruction of the squirrel, and the problem requires much serious attention.

Without doubt the ground squirrel is the greatest pest with which the Califor-

nia agriculturalist has to deal. He takes toll from all. The orchardist, the farmer, the gardener, the ranchman, all contribute toward his support, and the cost of his keep has become so excessive he should be considered a menace demanding the attention of all landowners.

It may be said in advance that no germ has yet been found which, injected into squirrels, will result in the production and spread of a deadly disease among them. Such a method would be ideal in squirrel eradication, and much work has been done and is being done in this direction, but a disease, harmless to man, yet fatal to squirrels and rapidly spread among them, has yet to be found.

It has been reported that in certain communities, farmers on finding sick squirrels have transported them for the purpose of infecting other localities. This should be discontinued at once, since such methods might easily be the means of transmitting plague, and the transportation of such diseased squirrels would seriously endanger the lives of those handling them.

There are three general ways in which squirrels may be readily destroyed:

- First*—By poisoning their food supply.
- Second*—By suffocation in burrows.
- Third*—By shooting or trapping.

Poisoning the Food Supply.

The poisons commonly used for this purpose are phosphorus, potassium cyanide and strychnine. They will be considered separately.

Phosphorus.—In the hands of many this poison has proven very efficient, but the care required in handling and the danger from fire restrict its use. In a limited way it may be found effective, but can not be recommended for general work.

Potassium Cyanide.—The deadly character of this poison and the extreme rapidity with which the acid of this salt acts is generally known and it has been much used, but in the ordinary strength used as an eradication agent this substance on a short exposure to the air becomes inert. When freshly prepared and exposed at once it is reported very effective, a fact which many farmers appreciate, but the great danger to life when handled carelessly and the rapidity with which its effects disappear on exposure remove any value it may have for general eradication work.

Strychnine.—Probably no other poison has been used so extensively, and this alone is indicative of its great value. This

poison presents but one objectionable feature: in use it passes out of the direct control of the operator and, being destructive to all forms of animal life, will kill whenever a sufficient quantity is ingested. For squirrel eradication it is ideal. It is small in bulk, easily transported, handled without danger, is comparatively cheap and may be readily mixed with all forms of food. Exposed during season, it is probable that 75 per cent of all the squirrels may be destroyed by it, and from an economical point of view the success of a squirrel eradication campaign will depend upon the thoroughness with which this poison is used.

The pure alkaloid should not be used. Some soluble salt of strychnine, as the sulphate, preferably, should be selected.

To be effective it must enter the circulation, and to reach this end must be mixed with the food. Such food should be obtained in the natural state and require little modification in the manufacture of the poison. It should be cheap, readily purchased and easily divided. Further, it should be objectionable to birds and capable of such disposition that sheep and cattle could not obtain it in poisonous quantities. Practical experience has demonstrated that some form of grain, as wheat, oats or barley, the more nearly conforms to these requirements, but when local conditions provide a special form of food acceptable to squirrels, such as oranges in the orange belt, etc., such material may be poisoned with strychnine and used to advantage.

Thallium.—This poison has been used quite extensively during recent years.

Wheat is an excellent base for the application of the poison and most acceptable to squirrels. It has been widely used, but the fact that it is readily eaten by birds has resulted in the destruction of quail and doves, and although their value to the farmer is not generally admitted, a poison causing such destruction can not be recommended. Further, its comparative cost must be considered.

Red oats are cheap, apparently readily eaten by squirrels, and form a good medium for the poison.

Barley.—This cheap and widely known cereal has been extensively used in eradication work, and is said to be most acceptable to squirrels. Many farmers have noted, and Mr. Piper of the United States Biological Survey has stated, that whole barley threshed but retaining the rough husk will not be eaten by birds, and this important fact is insisted upon in his use of the grain. In addition, its cheapness, the ease with which poison

may be applied, and its conformation to other requirements recommend it. The formula for its preparation is as follows:

Whole barley (recleaned) -----	18 pounds
Strychnine sulphate -----	1 ounce
Soda (bicarbonate) -----	1 ounce
Saccharine -----	1 dram
Thin starch paste -----	1 pint
Corn syrup (Karo or equal) -----	2 ounces

Dissolve the strychnine in hot water; thicken with starch to about the consistency of thin soup. Dissolve the soda in one-half pint of hot water and add a little at a time to the poisoned starch until effervescence ceases, then add the syrup and saccharine, mix well and apply to the bran, stirring constantly until the poison is evenly distributed throughout, and the grain is thoroughly dry.

Mr. S. E. Piper of the U. S. Department of Agriculture, the inventor of this formula, states that it is particularly advantageous on account of the fact that the bitter taste of the strychnine is delayed for several minutes and squirrels can pick up and place in their cheek pouches a considerable quantity before any bitter taste is noted; it is then too late for the squirrel to get rid of the poison, as enough of it has been absorbed through the mucuous membranes of the cheek pouches to kill the animal.

Extensive experience with this type of poisoned barley has shown an efficiency far ahead of any other type of poison grain tested. Young or half-grown squirrels have, in most instances, been practically exterminated and the percentage of adults or full-grown squirrels destroyed is far higher than with other types of poisoned grain used.

Using 12 to 15 pounds of grain instead of 18 pounds, as above, has given better results in many instances.

Caution.

All poison containers and all utensils used in the preparation of poisons should be kept *plainly labeled* and *out of reach* of children, irresponsible persons, and live stock.

Distribution of Poisoned Foods.

In placing the poison it must be remembered that we have to deal with a most cunning animal who quickly becomes suspicious when he finds food of a form and in a place new to his experience. He must be deceived. For this reason the food should receive little modification in its manufacture, and if made bitter by the poison it should be rendered more attractive by adding some sweetening agent. It should be scattered in small quantities, in piles of from 30 to

50 grains, preferably in the runways, apart from the burrows. It will probably be found most efficient if placed early in the morning.

When the poison fails to destroy, the cause must be carefully sought; the food may be unattractive, bitter or badly prepared; again, and more often, failure may be due to the method of application; the food may have been placed in such a way the squirrel is made suspicious, or other foods, such as green grain or grass, may be abundant and more attractive; or rain may have fallen and washed off the poison. No poison should be condemned absolutely until these points have been gone over.

It is a fact, proven experimentally many times, but not generally known, that less poison is required to kill a squirrel when the food is stored in the cheek pouches than when taken directly into the stomach. Poison is more slowly absorbed by the stomach, and some of it is destroyed, but it is rapidly absorbed from the cheek pouches, where from two to four times less poison is required to kill. Where 30 kernels of grain will quickly destroy life in the cheek pouches, 60 or 90 or more by the stomach may produce only a few convulsions and be recovered from. This fact should be remembered in placing poison, for by scattering the grain, a few kernels here and there near the runway, the squirrel is induced to store the grain temporarily in the cheek before a sufficient quantity is obtained for a meal.

The market affords a multitude of excellent prepared foods for squirrel destruction, the majority of which depend upon strychnine as the poisonous principle, but a properly prepared "home-made" poison is just as efficient and generally is more economical.

MORBIDITY*

Diphtheria.

44 cases of diphtheria have been reported, as follows: Berkeley 1, Livermore 1, Oakland 3, Bakersfield 1, Los Angeles County 6, Glendale 2, Long Beach 1, Los Angeles 11, Pasadena 2, Orange County 1, Fullerton 1, Santa Ana 1, Riverside 1, Sacramento 2, San Diego 1, San Francisco 3, Santa Clara County 1, Gilroy 4, San Jose 1.

Measles.

12 cases of measles have been reported, as follows: Berkeley 2, Oakland 1, Long Beach 2, Los Angeles 2, Anaheim 1, Orange 1, San Diego 1, San Francisco 2.

Scarlet Fever.

39 cases of scarlet fever have been reported, as follows: Albany 2, Berkeley 1, Oakland 1,

*From reports received on September 10th and 11th for week ending September 8th.

Eureka 2, Los Angeles County 1, Compton 5, Los Angeles 6, Monrovia 1, Pasadena 1, Brea 1, Orange 1, Riverside 1, Sacramento 6, San Diego 1, San Francisco 6, San Luis Obispo County 1, San Luis Obispo 1, Santa Clara County 1.

Smallpox.

15 cases of smallpox have been reported, as follows: Berkeley 4, Oakland 8, Contra Costa County 1, San Francisco 1, Tulare County 1.

Typhoid Fever.

15 cases of typhoid fever have been reported, as follows: Lassen County 1, Alhambra 1, Santa Ana 1, Riverside County 1, Sacramento County 1, Hollister 1, San Mateo County 3, Stanislaus County 2, Sutter County 1, Tulare County 2, California 1.

Whooping Cough.

93 cases of whooping cough have been reported, as follows: Oakland 6, Humboldt County 2, Los Angeles County 19, Burbank 1, El Monte 3, Glendale 4, Huntington Park 1, Los Angeles 22, Pasadena 1, Santa Monica 2, Bell 1, Orange County 1, Riverside County 1,

San Diego County 1, National City 9, San Diego 11, San Francisco 3, San Joaquin County 1, Santa Barbara County 2, San Jose 1, Watsonville 1.

Meningitis (Epidemic).

2 cases of epidemic meningitis have been reported, as follows: Merced 1, San Francisco 1.

Poliomyelitis.

6 cases of poliomyelitis have been reported, as follows: Los Angeles County 1, Glendale 1, Los Angeles 2, Santa Ana 1, San Francisco 1.

Plague (Bubonic).

Santa Barbara County reported one case of bubonic plague.

Encephalitis (Epidemic).

San Francisco reported one case of epidemic encephalitis.

Tularemia.

6 cases of tularemia have been reported, as follows: Modoc County 1, California 5 (from Nevada).

COMMUNICABLE DISEASE REPORTS

Disease	1928				1927			
	Week ending			Reports for week ending Sept. 8 received by Sept. 11	Week ending			Reports for week ending Sept. 10 received by Sept. 13
	Aug. 18	Aug. 25	Sept. 1		Aug. 20	Aug. 27	Sept. 3	
Anthrax-----	0	0	2	0	0	0	0	0
Botulism-----	0	0	0	0	0	0	0	0
Chickenpox-----	40	46	31	43	35	35	45	28
Diphtheria-----	64	46	45	44	57	87	98	88
Dysentery (Bacillary)-----	4	0	1	2	7	17	0	1
Encephalitis (Epidemic)-----	0	1	0	1	0	5	0	1
Food Poisoning-----	1	3	0	0	0	0	0	0
German Measles-----	13	11	8	6	10	11	6	8
Gonococcus Infection--	163	121	100	168	136	87	113	97
Influenza-----	16	7	7	24	3	5	5	5
Jaundice (Epidemic)-----	0	0	0	0	0	0	0	0
Leprosy-----	2	1	2	0	0	0	0	0
Malaria-----	0	3	0	0	1	3	0	1
Measles-----	4	12	20	12	58	44	27	23
Meningitis (Epidemic) --	4	3	2	2	3	2	4	3
Mumps-----	51	36	45	36	29	25	22	33
Paratyphoid fever-----	1	0	0	1	0	0	1	1
Plague-----	0	0	0	1	0	0	0	0
Pneumonia (Lobar)-----	22	22	24	45	59	38	31	17
Poliomyelitis-----	6	8	5	6	51	59	81	49
Rabies (Animal)-----	12	15	10	9	3	3	8	4
Rocky Mt. Spotted Fever	0	0	0	0	0	0	0	0
Scarlet Fever-----	38	50	34	39	50	45	49	47
Smallpox-----	6	12	7	15	6	3	7	5
Syphilis-----	123	154	157	159	130	84	126	159
Tetanus-----	1	2	3	2	2	4	1	2
Trachoma-----	1	1	2	2	2	1	0	1
Trichinosis-----	0	0	0	0	0	0	0	0
Tuberculosis-----	176	212	149	201	265	181	189	115
Tularemia-----	0	0	1	6	0	0	0	0
Typhoid Fever-----	23	26	44	15	26	16	12	10
Typhus Fever-----	0	1	0	0	0	0	0	0
Whooping Cough-----	188	136	134	93	160	121	102	82
Totals-----	959	929	833	932	1093	876	927	780

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